Vol. 1.] September, 1920. [No. 9.

AGRICULTURAL CIRCULAR

ISSUED BY THE

DEPARTMENT OF AGRICULTURE
FIJI

EDITED BY

THE SUPERINTENDENT OF AGRICULTURE

Annual Subscription, 3/

Price Fourpence

By Authority: S. BACH, Government Printer, Suva.

1920.

DEPARTMENT OF AGRICULTURE.

LIST OF STAFF OF THE DEPARTMENT OF AGRICULTURE.

Superintendent of Agriculture	The Hon. C. H. KNOWLES, B.Sc., (London).
Government Entomologist	(Vacant) C. H. KNOWLES Acting.
Government Mycologist	(Vacant).
Government Chemist	C. H. WRIGHT, M.A. (Cantab.), F.I.C., F.C.S.
Government Veterinary Officer	(Vacant).
Inspector of Produce	E. S. GORDON.
Assistant Inspector	M. B. WRIGHT.
Inspectors of Plantations	M. A. FORSYTH. H. V. RIVINGTON. (Vacant).
Curator, Botanical Gardens	C. H. KNOWLES.
Inspector of Plants (Suva)	E. S. GORDON. M. B. WRIGHT.
Inspector of Plants (Lautoka)	J. W. PHILLIPS.
Inspector of Plants (Levuka)	M. A. FORSYTH. Capt. D. ROBBIE (acting).
Inspector of Plants (Rotuma)	C. JACOBSEN.
Inspector of Stock (Rewa)	(Vacant).
Inspector of Stock (Suva)	J. S. MACNAIR.
Manager Rice Mill	J. P. TARBY.
Overseer, Experimental Station (Nasinu)	R. KNIGHT.
Manager, Navuso Estate	W. A. C. NIVEN.
Clerk	Miss E. THOMAS.
Typiste	Miss J. LIVINGSTON.
Editor, Agricultural Circular	The Superintendent of Agriculture.

AGRICULTURAL CIRCULAR

ISSUED BY THE

DEPARTMENT OF AGRICULTURE, FIJI.

Vol. 1.] SEPTEMBER, 1920. [No. 9.

EDITORIAL NOTES—SEPTEMBER, 1920.

The delay in issuing the September and October numbers of the Circular is due to pressure of office work which required immediate attention.

The benzine shortage brings again before those of the public who depend upon motors or launches for transport purposes the disadvantages of being entirely dependent upon a foreign supply of fuel. In the first place the fuel is exceedingly high in price, in the second place the whole supply may be entirely withheld and lastly most of the money spent on the fuel goes to a foreign nation. The position would be acceptable if there was no alternative, whereas we have in the Colony an ample supply of raw material which could be used to make a fuel which can be adapted to all the requirements. It need hardly be said that the fuel is alcohol and the raw material molasses. Without going into details as to the advantage of substituting alcohol for benzine, it may be pointed out that the outstanding gains would be reduced cost to the user and absolute freedom from shortage of fuel, and the great economic advantage to the Colony of no large sums of money having to be sent abroad. The possibilities of manufacturing commercial alcohol were investigated in 1917 by a Committee appointed by His Excellency, but for reasons which were sound at the time, the investigation was discontinued. The position as regards our fuel supply has not improved, rather the reverse, and the indications are that as time goes on we shall have to pay more for our fuel with increasingly greater chances of the supply being cut off. It is clear that the time is ripe for a further consideration of the matter.

The Government had secured five tons of Sea Island Cotton seed from Montserrat and St. Kitts in the West Indies. Owing to the discovery of the Pink boll worm in Montserrat, shortly after the seed had been shipped to Fiji *via* New York, it was decided to return the seed to the country of origin. This is extremely unfortunate, but by no means as bad as would have been the case had the outbreak of the pest not been discovered in Montserrat until the seed had been distributed in Fiji, bringing the pest with it. There was a clear indication that vigorous efforts would have been made for the re-establishment of the cotton industry in Fiji on an extensive scale, which it is hoped will only be postponed, by the failure to obtain seed in quantity, for one year. An effort is being made to obtain clean seed from another source for planting for nursery purposes. Any person who possesses, or knows of existing, Sea Island Cotton patches or plants is asked to communicate with the Superintendent of Agriculture, Suva.

We are glad to hear that Fiji is soon to have another industry—the extraction of oils from oil seeds. The mill will prepare primarily, it is understood, coconut oil from copra, but provided sufficient raw material can be obtained other oil seeds would be used. This mill offers therefore an outlet for cotton seed, the pressing of which is a valuable adjunct to cotton ginning in some of the ginneries in the West Indies.

With a large population of Indians, who do not use animal fats as a food, there is an immediate market for vegetable fats. Of these, mustard oil is the one which figures highest in our list of imports, and the quantities imported of recent years show that the trade is not an insignificant one. It is hoped that in time a careful investigation will be made as to the possibility of making the Colony independent of foreign sources of this commodity.

REPORT ON WORK AT THE CHEMICAL LABORATORY.

By C. HAROLD WRIGHT, Government Chemist.

I returned from leave on 13th March, 1920, and up to 13th November—that is during 8 months—the number of samples received for analysis is 162, of which only three are not finished. These samples may be classified as follows:—

Milks	81
Customs	19
Constabulary	6
Medical Department (excluding milks)	18
Fiji Defence Force	4
Telephone Department	1
Private	9
Agricultural	9
Laboratory	15
	162

I have also given evidence in Court eight times—four times in Suva, three times at Lautoka, and once at Nadururloulou. The number of samples received for analysis during the past eight months is greater than the total number formerly received in any whole year. The total number received in the years 1915 and 1917 were 86 and 84 respectively.

In paragraph 6 of M.P. 9909/18 I stated that there was chemical work which was not done because it was no one's duty to do it; and that if the system of payment by fees of analysis undertaken for other Departments were abolished many more samples would be received for analysis; and that if my title were changed to Government Chemist my services would be more fully utilised both by the Government and by the public. The large increase in the number of samples received shows that these opinions were correct, and it is very gratifying to me to feel that the help and advice and expert knowledge which can be given by a chemist are being more and more realised by the public and the Government of Fiji.

Milk.—The results obtained so far show that milk is adulterated to a considerable extent. Analysis of genuine milk as they come from the cow have shown that milk in Fiji is very similar in composition to milk in any other part of the world. Thus the mean composition of 32 single cow milks is:—Fat, 4·65; solids not fat, 8·75 per cent. Samples have been obtained from most of the dairies in Suva, and when these analysis are complete the results will be published in the Circular. It is hoped to deal with milk adulteration by a Food and Drugs Ordinance, of which I am at present preparing the draft.

Customs.—These include two samples of charas, one sample of gunjah and one sample of opium smuggled ashore; various medicines and proprietary preparations to be tested for alcohol, opium and Indian hemp; and a sample of water from Nasilai lighthouse received from the Receiver-General.

Constabulary.—These include four samples of alcoholic extract of *Cannabis indica* (Indian hemp), one hop beer, and a sample of kerosene.

Medical Department.—These include ten clinical therometers received from the Medical Officer of Health in order to be compared with an accurate thermometer two samples of Suva water taken by the Medical Officer of Health; two samples of olive oil, and two samples of hydrogen peroxide from the Government Pharmacist; and one sample of soap from the Chief Medical Officer; and viscera from the Colonial Hospital for toxicological examination.

Fiji Defence Force.—These samples consist of foodstuffs examined for poison in the hopes of finding some cause for the sickness from which the men in barracks were suffering. Tin was found in a stew containing tinned peas, and later the tinned peas were examined and found to contain an excessive quantity of tin.

Telephone Department.—An attempt was made to find a cheap solvent to remove the enamel from insulated copper wire.

Private.—These samples were analysed for private persons on payment of fees in accordance with the notice in the *Royal Gazette,* 1920, page 386.

Agricultural.—These include four samples of maize received from the Inspector of Produce, Suva, for determination of moisture; a copra, sheet of rubber, and citrate of lime received from the Superintendent of Agriculture. Para grass was analysed with the object of determining the ratio of lime to phosphoric acid in the ash. A preliminary investigation of the colouring matter in the fruits of *Clidemia hirta* (Koster's curse) was made, and dried material for a further investigation at the Imperial Institute was prepared.

Laboratory.—These include six samples of extract of *cannabis Indica* B.P. of known origin. Dr. Beam devised a test for cannabinol (the active principle of *Cannabis indica*) in gunjah, charas and hashish, but this test fails in the case of the alcoholic extract. As mentioned above I received four samples of the alcoholic extract from the Constabulary; I devised a method detecting the cannabinol in this preparation and the above six samples of extract of *Cannabis indica* were used to prove the reliability of this test. The other samples included under this heading are:—Two soaps, calcite from Nadroga, beeswax from Kadavu, two waters, and three samples of soapstone (not yet analysed).

I may add that most of the above work has been done under great diffiulties owing to my very limited laboratory accommodation. Lately the difficulties have been increased by the building of the extension to my laboratory. But soon I hope to occupy a really up-to-date laboratory and look forward to a further increase in my work, as the public and the Government Departments gradually learn the advantages to be derived from applied chemistry.

THE DRYING OF BANANAS.

By C. H. KNOWLES.

The green fruit contains a considerable percentage of starch which, when the fruit ripens, becomes converted into sugar. Dried green fruit is therefore a starchy material, whereas dried ripe fruit is sugary. Bananas may be dried in either condition, but the dried green fruit is the article more in demand since it can be used in place of other starchy materials while the use of dried ripe fruit is more limited.

The fruit in either condition may be dried by any means which will remove the moisure quickly enough to prevent the material from commencing to decompose through the agency of moulds or bacteria whose spores exist in the air, and which can only develop in material containing sufficient moisture. Properly dried, the fruit will keep indefinitely provided precautions are taken as are necessary with any similar classes of food.

Drying.—In some climates the fruit may be dried in the sun and requires no further treatment. Suitable weather conditions must be so regular for the commercial drying of bananas, that they may be depended on with certainty. And in Fiji this condition does not exist for any part of the Group. In such case, use must be made of some artificial means of drying the fruit.

Unripe fruit.—The following directions are given by the Rev. J. P. Hall of Jamaica (*Journal*, Jamaica Agricultural Society, April, 1897):—"(1) The fruit must be full, but not on the turn, and freshly cut. (2) The bananas should be peeled with silver or ivory knives and thrown into large tubs containing plenty of water. Another person should then cut each banana into thin flakes and spread them thinly on trays to dry. The quicker the fruit is handled, the better will be the result, as well as freedom from stain. I use machinery and by its use I am able to barrel the flour in six hours after the fruit has been cut. The fruit is dried by artificial means, ground to powder and sifted to produce a uniform article."

The *Agricultural News*, Vol. IX, p. 331, says that while the peeled banana contains only 1—2 per cent. of starch with 70 per cent. of sugar, made meal from green fruit shows the reverse of these proportions, namely, 80 per cent. starch, 3—4 per cent. sugar.

Artificial dryers.—Fawcett in his book " The Banana " (1913) has a chapter on drying where he first describes the reasons for drying and points out that the simplest process in to dry is the sun, but mentions the objections referred to above. He then refers to artificial dryers, and mentions the principles, and then describes various drying chambers, American fruit evaporators, and finally vacuum dryers.

The principle on which all hot air dryers depend is that the quantity of moisture which a given volume can take up increases with the temperature.

Air at ordinary atmospheric temperature is often nearly saturated with water vapour, hence drying by means of such air would be a very slow process. If the temperature however of the air is raised, the quantity of moisture it can hold is vastly increased and it can be made use of to extract water from " wet " material simply by passing such hot air over the material.

There is a limit however to which the drying air can be heated, particularly with food materials, and the temperature must not be so high as to char or burn the material. Spon suggests 240° F as the air temperature, but I think this is rather high and I suggest 160°—180° F, such as is used in the small Nasinu dryer.

Now, hot air weighs less than cold air, hence heated air is made to rise in a mass of cooler air in the same way that a cork, liberated below the surface of the water, is made to rise and float on the surface. Advantage can be taken of this fact, to make the hot air pass through the heating chamber automatically. This is accomplished by having a long flue on a suitable part of the chamber by means of which a " draught " is created, causing circulation of air through the chamber.

A dryer consists of a stove into which pipes are built communicating at one end with the atmosphere, and opening at the other into the drying chamber. The material is spread on trays in the chamber and at the opposite end to that at which the pipes open out is a tall flue. This should be as large and as high as can conveniently be built. The whole dryer must be air-tight.

The vacuum dryer depends for its working on the fact that the boiling point of water depends on the pressure above it. Thus at ordinary atmospheric pressure, water boils at 212° F, but by reducing the pressure the boiling point is so lowered that the moisture will quickly pass away from " wet " material at quite low temperatures. Thus at 95° F in a vacuum dryer fruit may be quickly dried.

The vacuum apparatus necessitating the use of pumps and other machinery necessitates considerable initial outlay and requires skilled attendance, but it is certainly an ecxellent method of drying bananas for flour, but it is apparently not so well suited for drying the ripe fruit.

Drying bananas in India.—Fawcett in his book states that the following special method of drying bananas is used in India. A special banana called " Rajeli " about six inches long is cultivated and the fruit is harvested when full but still green. The hands are put into a large store from which air is excluded as far as possible and after three days the fruit is taken out, when it is yellow. The skin of the fruit is then removed and the fruit spread on mats to dry in the sun. At night the fruits are gathered in a heap and left covered with dry banana leaves and a mat all night. This is repeated three days and nights and on the fourth day the fruits are ready for the market.

In Mexico.—Dr. Shier of Demerara paid considerable attention to the preparation and use of preserved bananas and flour. His studies were reported in the " Catalogue of the Paris Exhibition, 1867 " as below:—

" Dried yellow bananas exhibited at the great London Exhbition, 1851, which had been prepared in Mexico many years before proved the great superiority of them over figs in keeping properties and in immunity from insect ravages. In Mexico the simple exposure of perfectly ripe fruit to the sun's rays is sufficient to prepare them for the market in exportable form."

In Demerara however this method was not found to be adequate for the preparation of dried fruit. Dr. Shier mentions three modes by which the object can be attained:—

(1) By exposing the fully ripe fruit to an atmosphere of sulphurous acid gas previous to the drying being commenced.

(2) By a hasty boil of the fully ripe fruit in water containing sulphate of lime (hard water).

(3) By a simple parboil in syrup.

Dr. Shier then details the method of ascertaining if the fruit is fully ripe, which must be the case for the best results. In rainy weather, the writer states, the heat of an oven is requisite, but the oven should be left open at the mouth, else the fruit will be baked instead of dried.

Meal.—Dr. Shier refers to the nutritive qualities of banana meal and to the cheapness of the raw material. The meal he says is prepared by stripping off the husk (skin), slicing the core, and drying it in the sun; when dry it is powdered and sifted for use. The meal would be best and freshest on the European market if the sliced and dried fruit were exported, leaving the grinding and sifting to be done there. The flavour of the meal depends on the rapidity with which the slices are dried, hence the operation is only fitted for dry weather unless recourse were had to a kiln or stove. Above all, the fruit must not be allowed to approach to ripeness otherwise it becomes impossible to dry it sufficiently for the grinding to powder. The colour of the meal is injured when steel knives are used in peeling and slicing, but silver or nickel blades do not discolour it. (At Nasinu pieces of bamboo are used quite successfully).

Fawcett mentioned that while it is difficult to peel green bananas, this operation can readily be done if the fruit is first put into scalding water (at 176° F) for four to five minutes. The amount of water in the fresh fruit is something like 70 per cent. and Fawcett says this must be reduced by drying to 15 per cent. The peasantry in Jamacia cut the peeled bananas in to thin slices and lay them on stones in the sun. One day's hot sun is said to be sufficient to dry them.

Fawcett gives the following information relating to a factory at one time in operation in Jamacia, the apparatus used to dry the bananas being a vacuum drier:—

" The bananas while in the drier were continuously stirred by means of paddles. The drying was complete in two hours. By this time the bananas had been reduced to the appearance of somewhat coarse flour with only 15 per cent. of water. The flour was then removed from the dryer and sifted, the coarse material was then passed through a mill and again sifted. The flour was then packed in barrels and boxes lined with paper for export."

Fawcett states that it has been found better to export the dried " chips " rather than manufacture the flour.

Ripe fruit.—In drying ripe fruit care must be exercised as for green fruit, that the fruit is not discoloured by contact with steel or iron, and fully ripe fruit should be taken. This fruit does not become really " dry," but reaches the tough consistency of dried figs.

A United States Consular Report contains the following account of the preparation of a sweetmeat from ripe bananas in San Domingo:—

" Large quite ripe bananas are skinned and the fruit cut into slices about ¼-inch thick. The slices are sprinkled with fine or powdered sugar and placed in the sun on boards or trays. As the fruit dries it is turned over several times and each time dusted with sugar. In a few days it is sufficeintly dry and forms a crystallised conserve of delightful taste."

Composition and food value.—The headings in the following list are the authorities for the figures given below them:—

	The Lancet. Bananine.	*Petermann*	*Cousins (Jamaica).*	*Hutchinson. Banana flour.*	*Wheat flour.*
Water	14·60	5.60	10·88	13·0	13·8
Protein	19·22	3·13	0·71	4·0	7·9
Fat	2·0	1·73	0·22	0·5	1·4
Nitrogen free extract ..	61·98	82·39	60·42* 20·93†	80·0	76·4
Crude fibre	...	1·22	0·72	...	...
Ash	2·20	5·93	2·64	2·5	0·5

* Starch. † Pectin.

In Petermann's analysis the nitrogen free extract contains 7·19 per cent. of glucose, 3·34 per cent. of dextrin, and 45·76 per cent. of starch.

The flour is recommended as an excellent food for infants and invalids, and has considerable value in cookery.

Cousins says:—" From the chemical composition of this flour it is clear that practically the whole of it is readily digestible. The mineral matter contains soluble phosphates such as occur in wheaten flour. The flour consists almost entirely of carbohydrates of a readily digestible nature. The high proportion of pectin imparts to it the muculaginous properties of a fruit extract. I consider it a well-prepared article of high dietetic value."

Speaking of banana flour sold under the name of " bananine " the *Lancet* uses the following remarks:—" There can be no doubt of the nutritious character of banana flour and the starch in it is peculiarly easy of solution and digestion in the alkaline digestive juices of the body. Banana flour is readily dissolved for example,, by the saliva. We have received also a sample loaf made with baninane flour. The flour proves to make a very acceptable loaf, uniform in texture and permanently moist and of a golden colour."

The *Lancet* also says:—" For some reason not yet explained, the starch of the banana is much more digestible than are cereal starches besides which the fruit contains a notable proportion of nitrogenous material."

Dr. Hutchinson (" Food and principles of Dietetics, 1911 ") remark:—" Compared with good wheat meal, the banana is rich in carbohydrates and mineral matter, but very poor in proteid. If rice on the other hand had been taken for comparison it would now have been found that banana flour was about equal to it in nutritive value."

Dr. E. Pritchard (Brit. Med. Asso., 1910) recommended the use of banana flour for infant feeding. He stated it was cheap and wholesome, rendered the milk more digestible and possessed a high nutritive value. It is of great importance that infants should be trained early to digest cows milk. This cannot be done by giving them artificial substitutes which are pre-digested. The use of cereal decotion and solution of gum or gelatine undoubtedly makes the digestion of cow's milk easier, and Dr. Pritchard finds that a decoction of banana gruel has many points of recommendation. This can be made in a few muintes by rubbing up a heaped tablespoon of banana flour with a pint of water and then boiling for five minutes.

Dr. C. Stich, a food expert of Leipzig, writes:—" I have tested your banana flour and I have noticed how peculiarly soluble it is. By the addition of hot water the whole of the flour is made perfectly soluble and in a form very suitable for digestion.

In the *Colonizer*, January, 1906, mention is made of bananine. As made in British factories from West Indian products, this flour is said to possess a higher value as food than even beef, containing as it does as high a percentage of proteids, while its caloric or energy value is almost four times as great.

Yield.—Full-sized, well-filled bunches give 60 per cent. of peeled fruit, but in general Dr. Shier suggests 50 per cent. should be taken as the average quantity. The fresh-peeled fruit will yield 40 per cent. of dry meal, so that 20—25 per cent of meal. is obtained from the whole fruit, or 5 lb from a 25 lb bunch. An acre yielding 450 such bunches would therefore give 1 ton 10 lb of meal.

The Rev. J. P. Hall, previously quoted, states that 87 bunches, weighing 4,555 lb, yielded 452 lb of flour, equivalent to about 10 per cent. Another writer states that the variety known as the " Fig banana " yields much more flour. Fawcett states in Jamaica that as made by the peasantry, two bunches make 10 quarts of flour.

Experiments at Nasinu.

In 1919 40 lb of green bananas gave 20 lb of peeled fruit, which was sliced and dried at 160° F to 180° F in the dryer and gave 5 lb of chips, or 12½ per cent. of the green fruit. This flour was found to contain more moisture than the Jamaica sample and much more than the samples prepared in Europe. It seemed to keep well however. The ripe fruit has also been dried by using a steam-heated box which worked well. The following were the weights:—

17 lb ripe China bananas, 11 lb peeled, 2 lb 9 oz. dry (15 per cent.)
9½ lb ripe China bananas, 6½ lb peeled, 1 lb 12 oz. dry (18·4 per cent.)
30 lb ripe Gros Michel bunch, 11 lb peeled, 2 lb 12 oz. dry (9·2 per cent. of bunch.
32 lb ripe China bananas, 16 lb peeled, 3 lb 3½ oz. dry (10 per cent of bunch).

The dried slices were excellent eating and showed no signs of mouldiness. It was found, however, that when exposed to the air they were attacked by a moth which lays eggs on the dried material from which hatched caterpillars which commenced to eat the dried bananas and of course rendered them unfit for human consumption. This, it may be pointed out, is not a special character of dried bananas, but is possessed by very many other preparations such as currants, flour, maize, rice, &c., &c., To avoid attacks the material should be packed immediately after drying and used or exported as fast as it is made.

COPRA.

By C. H. WRIGHT, Government Chemist.

Copra is the dried kernel of the coconut, and is made and exported on account of the coconut oil contained in it. The kernel is dried partly to reduce the weight and thus save freight, but chiefly to prevent the copra becoming mouldy with consequent deterioration of the contained coconut oil. For reasons to be explained later there is now required a much better quality of copra than formerly. Fiji copra has already got a bad name owing to the inferior quality of copra which has been shipped from Fiji in the past. If all planters and merchants clearly understood the reasons why a better quality of copra is now demanded, there is no doubt that they would make every effort to improve the quality of their copra, and Fiji copra would no longer be looked upon with disfavour, as it is at present. It is therefore advisable to explain the reasons why there is now a demand for a much better quality of copra, and for this purpose it is necessary first of all to consider the uses of copra and the coconut oil prepared from it.

Coconut oil is obtained from copra on the large scale by subjecting it to pressure in hydraulic presses. The copra is first finely ground and then warmed to a temperature of 130° F to 140° F and pressed whilst hot. The copra remaining is then reheated and pressed a second time at a greater pressure. Copra generally contains from 60 to 65 per cent. of oil, but the whole of this oil cannot be extracted by pressure. The yield of oil varies from 56 to 63 per cent. of the copra, depending on the percentage of oil in the copra. The pressed cake left over after the copra has been subjected to pressure contains from 5 to 10 per cent. of oil. Sometimes part of this oil in the press cake is extracted with carbon disulphide or other solvent, and a further quantity of coconut oil of inferior quality is thus obtained. But it is not possible in this way to extract the whole of the oil from the press cake.

Formerly the chief use of coconut oil in European countries was for making soap. For this purpose coconut oil possesses special advantages; it produces a hard white soap, and is hence largely used in making toilet soap; it also possesses the great advantage (to be explained later) of undergoing saponification at ordinary temperatures. Hence there is a great demand for coconut oil for soap making; but it is important to notice that for this purpose almost any grade of coconut oil will suffice. Coconut oil prepared from improperly dried and mouldy copra is not only acid (as will be explained later) but has an unpleasant taste and smell; these defects are, however, of no great disadvantage to the soap maker. Even the coconut oil prepared from smoke-dried or kiln-dried copra, which has a brown colour and smoky smell can be used for making soap.

Under these conditions it will be seen that there was very little inducement to the planters to produce good copra, but nowadays this state of affairs is quite changed. About the beginning of this century coconut oil began to be used in making margarine, which had formerly been made from animal fats only. To-day large quantities of coconut oil are used in making margarine, vegetable butter, and edible fats used by chocolate manufacturers, biscuit bakers and confectioners. For these purposes high grade coconut oil which is free from fatty acids (this will be explained later), and has a pleasant taste and a nut like odour, is required; and the inferior grades of coconut oil, which of course are sold at far lower prices, are used by soap

makers. Hence there has sprung up in Europe and the United States of America, especially since the war began, a great demand for high grade coconut oil; and this can only be produced from clean, well-prepared copra, for which ,consequnetly, there is now a great demand.

Another reason why it is necessary that clean, well-prepared copra should be prepared is that the press cake left over after pressing out the oil from the copra is a valuable commercial commodity. This press cake, which as will be gathered from what has been stated above, amounts to from 46 to 37 per cent. of the weight of the copra, is known as coconut cake or coconut meal and is used as a cattle food. Coconut cake of good quality has the pleasant nut-like smell of fresh coconut oil, but it is obvious that such coconut cake can only be prepared from copra of good quality. From low grade copra there will be produced a coconut cake which will soon become mouldy, and will hence be unsaleable as cattle food.

Before the War large quantities of copra from British possessions were exported to Germany and Austria. The quantity of copra from British possessions imported by these countries is estimated to have been no less than 150,000 tons per annum, valued at £3,250,000 (see *Oil Seeds and Feeding Cakes*, Imperial Institute Monographs, London, 1915). In Germany and Austria the copra was pressed in order to obtain coconut oil, a great deal of which was exported to the United Kingdom, and the resulting press cake was largely used as a cattle food. Since the outbreak of war, much larger quantities of copra than formerly are imported into Great Britain, and owing to the efforts of the Board of Agriculture and Fisheries, coconut cake is now being extensively used by British farmers as a feeding stuff. The price of coconut cake is now fixed by the Government; in June of last year the price of British made coconut cake was £16 5s. per ton, and the price of imported coconut cake £17 10s. per ton (see *Journal of the Board of Agriculture*, June, 1918). These figures are given to show that coconut cake is a valuable commercial commodity, and it will thus be seen that anything which in any way interferes with the use of the press cake as a feeding-stuff will considerably lower the price of the copra per ton. Copra is not extensively adultered in Fiji, but cases have been met with in which the copra was mixed with foreign substances, which would undoubtedly prevent the press cake from such a copra being used as a feeding stuff. One sample of copra analysed contained no less than 15 per cent. of sea sand. Another contained only 82 per cent. of copra; it also contained 1 per cent. of pumice, 10 per cent. of coral and sea shell, and the remainder (*i.e.*, 7 per cent.) was made up of coconut shell, wood, straw, twine, and what looked like sweepings from the floor.

It is now necessary to explain what is meant by free fatty acids which occur in coconut oil produced from inferior copra. Oils and fats are similar in chemical composition, and consist of glycerin in combination with fatty acids. When an oil or fat is heated with caustic soda, the fatty acids combine with the caustic soda forming a hard soap; if caustic potash is used in place of the caustic soda a soft soap is produced. This process, known as saponification, is the means by which soaps are produced on the large scale; in this process glycerin is also formed, and on the large scale is separated by distillation from the soap lye. In the case of coconut oil, as mentioned above, saponification takes place at ordinary temperatures, and no heating is necessary. When coconut oil is mixed with a strong solution of caustic soda at ordinary temperatures the mixture becomes hot, and a hard white soap is formed. The ease with which coconut oil is saponified (technically known as "cold saponification") is the chief reason why coconut oil is

employed to such a large extent in soap making. If a solution of soap be treated with hydrochloric acid the fatty acids are liberated, and since they are no longer in combination with caustic soda as they were in the soap, or with glycerin as they were in the oil or fat from which the soap was prepared, they are known as *free* fatty acids. These fatty acids, of which a great number are known ,are grouped together because they are chemically similar. Some, such as stearic acid and palmitic acid, are solids; others, such as oleic and butyric acid, are liquids. Under certain conditions, which will be explained later, oils and fats are split up into free fatty acids and glycerin. This decomposition of an oil or fat is not always noticeable because the free fatty acids are soluble in oils and fats. Sometimes, however, the liberation of free fatty acids is accompanied by rancidity, in which case their presence is betrayed by the disagreeable smell of the oil or fat.

According to the late Dr. J. Lewkowitsch (*Oils, Fats and Waxes*, Vol. II, 1914, p. 626), three kinds of coconut oil are distinguished in commerce; these are:—(1) Cochin oil; (2) Ceylon oil, and (3) Copra oil. Of these Cochin oil is the finest and whitest of the three. Cochin oil was formerly prepared on the coast of Malabar by boiling the fresh kernels with water and skimming the oil, which thus rose to the surface. Nowadays oil presses have been introduced, and a good deal of Cochin oil is prepared in India from copra made on the Malabar coast. The oil thus prepared by modern methods is in no way inferior to the oil prepared from fresh kernels, and contains from 1·5 to 3 per cent. of free fatty acids (calculated as oleic acid). Ceylon oil is prepared in Ceylon by boiling the fresh kernels with water, by " chekkus " (native presses) and by pressing sun-dried copra on European estates. Ceylon oil contains a higher percentage of free fatty acids than Cochin oil, viz., 5 to 10 per cent., and thus represents a second quality of coconut oil. Copra oil is prepared in Europe, the United States of America, and Australia from imported copra. The percentage of free fatty acids in copra oil varies greatly. Only the most carefully prepared copra will yield an oil which is suitable for edible purposes. A great deal of copra oil, which contains up to 25 per cent. of free fatty acids, can only be used for making soap.

It will thus be seen that unless great care is taken in the preparation of the copra the expressed oil will contain large proportions of free fatty acids which render the oil unsuitable for edible purposes. The decomposition of the oil into free fatty acids is due ro moulds which grow on the copra, and anything which favours the growth of moulds will have the effect of increasing the percentage of free fatty acids in the contained oil. Moulds thrive best when the copra contains from about 10 to 15 per cent. of moisture. If, however, the percentage of moisture in the copra is 6 per cent. or under the conditions are no longer favourable to the growth of moulds, and furhter decomposition of the oil is arrested. Many copras are met with in Fiji containing more than 6 per cent. of moisture. One copra from Lautoka was found to contain no less than 11.79 per cent. of moisture, and the oil contained 7·3 per cent. of free fatty acids. On keeping this sample in the Laboratory for one week it became covered with mould, and it was then found that the oil contained 15·7 per cent. of free fatty acids. This shows how rapidly the free fatty acids are formed when the conditions are favourable to the growth of moulds on the copra. On the other hand four samples of copra prepared in the dryer at Nasinu Experimental Station by heating copra for different lenghts of time were found to contain 6·10, 4·83, 4·58, and 3·84 per cent. of moisture. These four samples when kept for some weeks in the Laboratory showed no signs of mould, and the oil in three of them (one not being further examined) contained 0·4 per cent. of free fatty acids.

Not only do moulds cause the formation of free fatty acids in the oil, but they utilise the oil as food material for their own growth, thus causing the decomposition of the oil; and under the most favourable conditions this loss may amount to 30 or 40 per cent. of the total oil present. This subject has been investigated by Messrs. H. C. Brill, H. O. Parker, and H. S. Yates in the Philippine Islands (see *Philippine Journal of Science*, 1917, A XII, p. 55). If copra contains sufficient moisture for the growth of brown mould (*Aspergillus flavus*) a loss of 40 per cent. of the oil may take place. This species is often associated with black mould (*A. niger*), which only appears on copra containing at least 12 per cent. of moisture. It causes a pronounced loss of oil (sometimes over 40 per cent.) and gives rise to the formation of free fatty acids, though not to the same extent as brown or white moulds. Where green mould (*Penicillium glaucum*) alone is present, there is but little loss of oil, but its presence indicates a proportion of moisture favourable to the development of the other moulds. The white mould (*Rhizopus sp.*) requires an atmosphere saturated with moisture, and then only develops on fresh copra, and is killed as soon as the drying process begins.

Hence the art of making good copra is to dry the kernel as quickly as possible until it contains 6 per cent. of moisture or less. The loss of oil is thus reduced to a minimum and the formation of free fatty acids prevented. Good copra contains 6 per cent. of moisture or less, and at least 62 per cent. of oil; the contained oil should contain not more than 1 per cent. of free fatty acids (calculated as oleic acid). Such copra is white, or faintly grey in appearance, and has the fresh, nut-like smell of coconut. When broken across in the fingers it should break with a distinct snap; this shows that the copra has been sufficiently dried. When cut across, the freshly-cut surface should be white and have a mother-of-pearl lustre; this is evidence that moulds have not pentrated the copra and caused the deterioration of the oil.

ANALYSES OF COPRA.

Description of sample.	*Moisture, per cent.*	*Oil, per cent.*	*Free fatty acids, per cent. in oil.*
1. Native copra from Nadroga ..	5·71	61·99	...
2. Sun-dried copra from the Gilbert Islands	5·63	61·81	1·8
3. Do.	5·56	62·02	2·2
4. Do.	4·80	67·35	11·6
5. Copra from Yasawa	11·16	60·36	4·7
6. Copra from Lautoka	11·79	60·54	7·3
7. Copra from European estate ..	7·78	65·60	8·4
8. Do.	5·80	64·63	2·9
9. Do.	6·00	61·83	7·1
10. Copra prepared in drier at Nasinu	6·10	63·75	0·4
11. Do.	4·58	65·09	0·4
12. Do.	3·84	66·77	0·4

In the table above are given the analyses of representative samples of copra. From these results of analyses, and the well-known appearance of much of the copra in Fiji, it is only too evident that most of it falls far short of the standards of good copra as stated above; though for reasons already given every effort should be made in Fiji to prepare a better quality of copra conforming to these standards.

The quality of sun-dried copra is to a very large extent dependent on climatic conditions; thus Lewkowitsch states that one reason why Cochin

oil is superior to Ceylon oil is that the dry season during which copra is prepared is a few months longer on the Malabar coast than in Ceylon. Other countries, the copra from which has obtained a good reputation in the open market, such as Seychelles, have a well-marked dry season during which sundried copra can be easily prepared. In many parts of Fiji there is no well-marked dry season, and it must be admitted that the climate in many parts of Fiji is not favourable to the production of good sundried copra. Such being the case, the only remedy is to use artificial dryers ; the planter is thus independent of the weather, and as a result a much better quality of copra will be prepared. That good copra conforming to the standards laid down above can be produced in Fiji is shown by the analyses of copras made in the dryer at Nasinu Experimental Station (Nos. 10, 11, and 12 in the table). It will be seen that the oil in these copras contains 0·4 per cent. only of free fatty acids.

Though it is necessary to dry the kernel as quickly as possible to prevent moulds growing on the wet copra and decomposing the contained oil, special precautions should be taken to prevent the copra in a dryer from being heated to such a high temperature that it is " burnt." When this takes place there is evidence that the part of the copra which is not oil undergoes change to a far greater extent than the oil itself; but the oil is to a certain extent changed as is shown by its darker colour. There is, however, no increase in the proportion of free fatty acids when the copra becomes " burnt." Some coconut oil prepared at Nasinu Experimental Station from such pieces of " burnt " copra was dark coloured, but had the fresh nut-like smell of coconut and contained 0·6 per cent. only of free fatty acids.

Summary.

(1) Copra is exported for the sake of the contained coconut oil which is obtained by pressing the copra in hydraulic presses.

(2) Coconut oil is used for making soap and for edible purposes, but whilst almost any kind of coconut oil will suffice for soap making, only the finest grades of coconut oil (containing very small quantities of free fatty acids) are suitable for edible purposes.

(3) Badly prepared and mouldy copra yields an oil which is suitable for soap making only, and it is only from clean well-prepared copra that coconut oil suitable for edible purposes can be obtained. Nowadays there is a great demand for high grade coconut oil for edible purposes (chiefly for making margarine), and as a consequence there is a great demand for good quality copra.

(4) Most of the Fiji copra yields oil which contains large quantities of free fatty acids, and is therefore unsuitable for edible purposes. These free fatty acids are formed by moulds growing in the copra.

(5) Moulds thrive best when copra contains from 10 to 15 per cent. of moisture. If, however, the moisture is reduced to 6 per cent. or less, the conditions are no longer favourable to the growth of moulds, and the decomposition of the oil is arrested.

(6) Hence the art of making good copra is to dry the copra as quickly as possible until the moisture content is 6 per cent. or less. Copra thus prepared is free from mould, and the oil contains only very small quantities of free fatty acids.

(7) In parts of Fiji where climatic conditions are unfavourable to the production of good sun-dried copra the only way to effect an improvement in the quality of the copra is to use dryers, and thus be independent of the weather.

EXTRACTS FROM REPORTS OF INSPECTORS.

Coconut Scale (*Aspidiotus species.*)

Mr. M. A. Forsyth reports that on Ovalau there is in general an improvement in scale on coconuts. There is no re-appearance of the pest on the palms of these towns already reported as having been cleared of the scale.

Viro and Bureta, two badly-infested areas, also show improvement.

On Moturiki, except for one or two very badly-infested areas, there is also some improvement.

Natewa Bay.—At the request of the Manager of a coconut plantation in Natewa Bay, Mr. Forsyth paid a special visit to investigate an attack which had been alleged to be scale on the coconuts. Several coconut plantations on Vanualevu were visited in addition to these in Natewa Bay, and Mr. Forsyth found no evidence whatever of the presence of scale on the coconut palms or on bush plants.

The leaf miner (*Promecotheca Reichii*) was prevalent everywhere, but the damage is not such as to give rise to any alarm, as there is no reason to suppose that the relations between the pest and its parasite, which under normal conditions keeps it in check, have been permanently disturbed.

Phasmids in some areas have caused considerable damage, and probably it was the distruction of leaf material due to these insects which gave rise to the fear that scale was present. On one plantation a palm was found which was thought to show signs of Budrot. It was destroyed by fire.

Immature nuts appear to be falling rather freely in some parts, which may be due to the exceptionally dry weather lately experienced.

The depredations caused by flying foxes or rats were particularly noticeable at one plantation in Natewa Bay.

On the return to Levuka the cutter called at Koro, but did not stay long enough to permit of a visit ashore. The appearance of the palms seen from the boat was healthy and vigorous.

A report has been received that scale has been found by natives on the island of Nairai on yaqona, and a visit will be paid to the island as soon as it can be arranged.

Reports have been regularly received from Wakaya that scale has not been found on the bearing palms, but young trees are cometimes found showing it.

INSPECTION OF PRODUCE.

The Assistant Inspector of Produce reports that during the month inspection of produce for shipment abroad covered the following:—169 sacks and 10 cases kumalas, 571 sacks maize, 13 sacks peanuts, 10 sacks taro, the equivalent of 8,991 bunches of bananas for Sydney, the equivalent of 19,940 bunches of bananas for Melbourne, and the equivalent of 30,719 bunches of bananas for Auckland; total bunches, 59,650. Inspection of all incoming produce was made and treatment was necessary in the case of one package of seeds from India which was fumigated.

NOOGOORA BURR.

Mr. H. V. G. Rivington reports having visited 52 holdings in the district of Ba between 13th and 30th September inspecting for Noogoora Burr. the following being a summary of his observations:—Land clean, 35 holdings; burr present, but being kept in ckeck and eradication proceeding, 5 holdings; burr present in small quantity, 2 holdings; burr neglected, 10 holdings total, 52 holdings.

Notices to have burr cleared were issued in three cases, and in nine cases in which notices had previously been given, but not complied with, informations were laid at the District Commissioner's court.

In two cases special visits were paid to investigate reported occurences of the burr, but the plant suspected proved to be the castor-oil plant.

INSPECTION OF FRUIT.

The s.s. "Atua" loaded bananas for Auckland and sailed on 2nd September. The fruit cargo consisted of 381 bunches and 15,113 cases, equivalent to 30,607 bunches. The rejects amounted to 7·4 per cent. of the shipment. Ripe fruit was scarce, rejections being principally on account of immature or under-sized fingers. The fruit was carefully handled and stowed, ample dunnage provided, and ventilation sufficient. Rain interferred with the loading at times. No. 3 hold had a slight amount of coal dust about, otherwise the holds were clean. A small amount of fruit was carried on deck owing to holds being full. The fruit on the whole was not of first class quality, being cut before it was sufficiently mature. The shipment included some fruit from Nadroga of excellent quality.

The s.s. "Levuka" took a total fruit cargo equivalent to 31,748 bunches, made up of 2,651 bunches of bananas and 1,566 cases for Sydney, and 8,043 bunches and 8,961 cases for Melbourne. The vessel sailed on 14th September. Rejections amounted to 6·3 per cent. of the shipment. The fruit throughout was of fair quality, and again Sigatoka was represented with some excellent fruit. Cases were clean, well packed and well nailed. Rejections for ripe fruit were noticably smaller. All fruit was carefully handled and stowed, plenty of dunnage provided and used, and ventilation spaces ample. The holds were in a thoroughly clean condition. The temperature of the cold air supply was 20° F when loading commenced. A trial shipment of kumalas was sent by the steamer to Sydney.

INSPECTION OF VESSELS.

The following list shows the numbers of vessels inspected during the month of September, 1920, under the Diseases of Plants Ordinance 1913 Regulations, and the number of cases in which material was destroyed:—

Port.	*No. of vessels inspected.*	*Cases in which material was destroyed.*
Suva	4	1
Levuka	92	24
Lautoka	5	—

REPORT ON VAU BARK AND STEMS FROM FIJI.

The samples of Vau bark and stems (*Hibiscus tiliaceus*) which are the subject of this report were forwarded to the Imperial Institute by the Superintendent of Agriculture, and are referred to in his letter No. 485/1919, dated the 7th November, 1919.

Description.

No. 1, *Fibre from old wood, unscraped* (weight, 1½ lb).—This sample consisted of strips of bark about 5 to 6 feet in length, composed of a silver-grey outer bark containing a very coarse fibre, and an inner bark containing a finer brown bast fibre.

No. 2, *Scraped bark* (weight, 1½ lb).—This material was similar to No. 1, but part of the outer layer had been removed before drying; it was very stiff and gummy.

No. 3, *Young shoots* (weight, 2 lb).—This sample consisted of young stems 12 inches in length, consisting of fibrous bark enclosing a soft wood.

Results of Examination.

(1) Attempts were made to de-gum the scraped bark, both by retting with water and also by treatment with hot dilute alkali. After two months immersion in water the gum did not appear to have softened appreciably, but by treating the bark with a solution of alkali a rather harsh interlaced fibre was obtained, which might be suitable for rope-making.

(2) The stems were examined as a paper-making material with the following results:—

	Per cent.
Moisture	9·3
Ash	1·8
Cellulose in material as received	45·2
Cellulose expressed on the dry material	49·9

Length of ultimate fibres:—From 0·8 to 1·6 mm.; average, 1·2 mm.

On treatment with caustic soda under conditions similar to those employed on a commercial scale in the preparation of paper pulp the following results were obtained:—

Experiment.	Caustic soda used.		Conditions of boiling.		Parts of caustic soda consumed per 100 parts of stems.	Yield of dry pulp expressed on stems as received.
	Parts per 100 parts of stems.	Parts per 100 parts of solution.	Time.	Temperature.		
A	16	3	7 hrs.	140°C	11·1	54
B*	16	2·5	5 hrs.	160°C	12·4	46
C	22	4	6 hrs.	160°C	13·2	36

* In this experiment the bark was removed from the stems and the wood only employed.

When boiled under the usual conditions, *i.e.*, with a low percentage of caustic soda, the stems gave a good yield of pulp, which however did not break up completely (see enclosed specimen of paper A) and could not be bleached (see specimen A1). The removal of the bark before the preparation of the pulp in Experiment B did not appear to make any appreciable difference to the pulp obtained (see specimens B and B1).

A better product was obtained on treating the stems under the more drastic conditions of Experiment C, but even in this case the pulp did not beat very well and could only be bleached to a cream colour (see specimens C and C1).

The average length of the ultimate fibres (1·2 mm.) is rather short, and the pulp is consequently of somewhat poor quality.

Results.

The fibre of *Hibiscus tiliaceus* is stated to be used in India for making rough ropes and cordage, and in Ceylon for mats. The fibre is very resistant to water, and retains its strength after being soaked in water for several weeks. In the Federated Malay States, in order to obtain the fibre, the bark is stripped from the stems and allowed to dry for two days, when the outer layer, which is very coarse and of no value, is easily separated from the inner bark.

A sample of well-cleaned fibre of good colour, and resembling jute, but harsher, prepared in the Gambia from *H. tiliaceus*, was examined at the Imperial Institute in 1907, and was valued at £14 per ton in the United Kingdom, with "medium jute" at £16 to £17 per ton.

Although clean fibre could not be prepared from the bark as received at the Imperial Institute by retting, it should be possible to ret the freshly-collected bark in Fiji by methods similar to those employed in the case of jute, and if this is attempted samples of the cleaned fibre might be forwarded to the Imperial Institute for examination. Strips of bark, as represented by the present samples, would not be saleable in the United Kingdom.

The stems give a good yield of pulp when subjected to mild treatment with caustic soda, but the quality of the pulp is rather inferior. The stems could not be profitably exported in the raw condition, and it is probable that if they were converted into pulp in Fiji the pulp would not be of sufficient value for export although it would be suitable for the manufacture of wrapping paper for local use.

SEEDS AVAILABLE AT NASINU.

Seeds of the following plants are available at Nasinu, and may be obtained in limited quantities by application to the Superintendent of Agriculture, price 6d. per packet:—

Melon—*Cuban Queen.*
Lima Bean—Edible.
Butter Beans—Edible.
Cowpea, *Victor*—Green manure crop.
Jerusalene Pea—Green manure crop.
Velvet Bean, *Alabama*—Green manure crop.
Cucumbers—Commercial.
Fodder Plants:—*Sorghum*—Varieties: Sholla, Sumac, Dwarf Kaffir, Honey, Dwarf Milo, Feterite, Red Amber.
Sudan Grass, Teosinte, Carib Grass, and Mission Grass.

The two last named are grasses introduced from America and recommended by the Department of Agriculture for trial. Both are vigorous growers, and on a hill-side of red-brown soil at Nasinu gave an excellent stand of fodder some 3 feet high.

DEPARTMENTAL NOTES.

Mr. C. H. Wright, M.A., F.I.C., Government Chemist, proceeded to Levuka on 21st September to conduct an investigation as to the quality of milk supplied by registered dairies at Levuka. After leaving Levuka Mr. Wright proceeded to Lautoka to give evidence as to the identity of a certain substance the subject of a police prosecution, returning to Suva on 9th October.

Lieut.-Colonel Rainey, C.B.E., M.R.C.V.S., having resigned from the post of Government Veterinary Surgeon, left the Colony by R.M.S. "Tahiti" on 28th September.

Mr. E. S. Gordon was appointed Inspector of Produce on 1st October. For work in connection with the inspection of produce exported, Mr. Gordon is an Inspector under Ordinance No. XXI of 1906; and for inspection of incoming produce, an Inspector under Ordinance No. VI of 1913.

COFFEE AS A BEVERAGE.

In Great Britain coffee has never attained the popularity that it has gained on the Continent of Europe. Thus it has said that the consumption in England in 1902 was less than 1 lb per head whereas in Holland the consumption was 21 lb. The fact that Java, Holland's chief Colony, is one of the chief coffee producing-countries may have had comething to do with this, but it may partly be explained by the facts that in England it is not generally known how to make coffee, while it is much more expensive than tea.

Coffee should be freshly roasted in order to try it at its best. The beans should be sorted out and beans of as nearly equal size as possible should be roasted at one time. Small roasting machines may be obtained, but a satisfactory manner is to use either an earthenware crock which will stand heat or an ordinary iron frying pan. Whatever method is used, means must be introduced for stirring the beans during the process so as to heat them uniformly. The roasting process should be continued until the beans are an uniform dark cinnamon colour. It is likely, with primitive roasting in a frying pan, that some beans will be nearly black, before all are sufficiently roasted, but the matter is one chiefly of practice.

During the roasting, moisture and some organic matter is lost, the total loss being from 13—20 per cent. by weight, overroasting causes an excessive loss of caffeine, the alkaloid which gives coffee its stimulative properties. During the process of roasting, an oil is produced which gives coffee its aroma; its perfume is so strong that a single drop is said to be sufficient to scent the whole room.

The coffee, when roasted, is brittle and may be ground, and it should not be ground too fine. Grind it while hot. Previous to grinding see that the machine is perfectly clean and free from any old coffee. Place the ground coffee in a jug and set the jug in the oven to get hot, placing a pinch of salt over the ground coffee. When hot, pour on boiling water and stir well, and replace in the oven or elsewhere to keep hot while allowing the sediment to settle. Coffee should be strong and should be hot, but should never be boiled.

A heaped tablespoon of ground coffee should be used for each large cup. After about 20 minutes, pour the coffee through a strainer or piece of folded muslin into a hot jug or coffee pot, when it is ready for use. Use hot milk. The addition of chickory in many commercial coffee mixtures appears to be appreciated by some people and it makes a dark coloured beverage, certainly, because in roasting the roots, which make chickory, some "caramel" (burnt sugar) is produced, but if coffee is properly made it requires the addition of no material of doubtful value to make it palatable.

The coffees grown at Nasinu and procurable there in small quantities at 1s. per lb are of three varieties—Liberian, Arabian, and Angola; a fourth variety—Robusta—will shortly be available.

Arabian.—Arabian is the variety which constitutes the real Mocha coffee. It reaches perfection only at some elevation in the tropics, hence the Nasinu product is to be considered as below the Liberian in quality.

Liberian.—Liberian is a West African coffee of robust habit. As a rule it is not regarded as being a good coffee. In Sydney, Nasinu-grown Liberian was reported on as being the best of this variety which had been examined by a large coffee firm, and they stated they considered it quite attractive.

Angola.—This comes from Portugese West Africa and is a very small berry. Owing to its size it is somewhat easily over-roasted, but with care quite a useful coffee may be made. It makes a good mixture with either of the other coffees.

Robusta.—Some excellent samples of this have been made, but it has not yet had an extended trial.

Sample packets of 2 lb of the above varieties except Robusta may be obtained sent to any address in the group for 2s. 6d. by application to the office of the Superintendent of Agriculture.

Agricultural Associations in Fiji.

THE COUNCIL OF PLANTERS OF FIJI.

Chairman.....MR. J. L. HUNT.

Vice-Chairman.....MR. E. DUNCAN.

Secretary and Treasurer.....MR. M. H. DART.

ASSOCIATED BODIES.

THE CAKAUDROVE COPRA GROWERS' ASSOCIATION.

THE CANE GROWERS' ASSOCIATION OF FIJI (BA AND NADI BRANCHES.)

THE LABASA PLANTERS' ASSOCIATION.

THE SAVUSAVU PLANTERS' ASSOCIATION.

THE SOUTHERN DISTRICTS PLANTERS' ASSOCIATION.

CONTENTS.